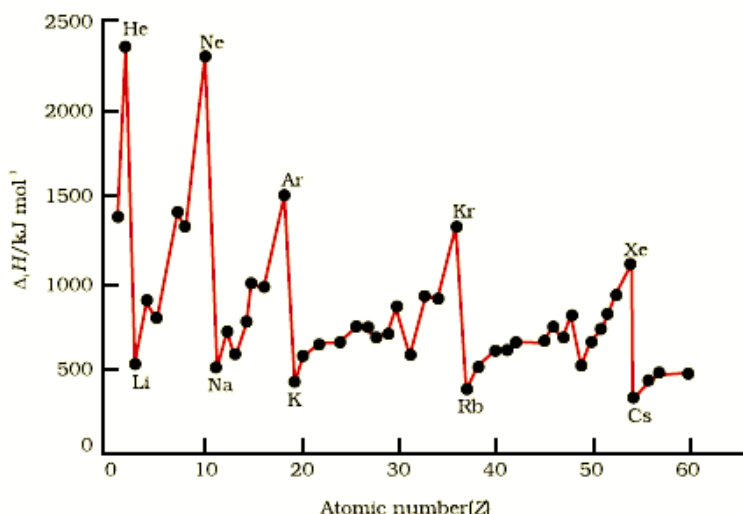


**PREVIOUS HSE QUESTIONS FROM THE CHAPTER "CLASSIFICATION OF ELEMENTS AND PERIODICITY IN PROPERTIES"**

1. Among  $\text{N}^{3-}$ ,  $\text{O}^{2-}$ ,  $\text{F}^-$ ,  $\text{Na}^+$  and  $\text{Al}^{3+}$ , which one has the smallest size? (1)
2. Give reasons for the following :
  - a) 'O' has lower ionization enthalpy than N and F.
  - b) Cl has higher negative electron gain enthalpy than F. (3) [August 2018]
3. Which is the acidic oxide among the following?
  - a)  $\text{Cl}_2\text{O}_7$       b)  $\text{Na}_2\text{O}$       c)  $\text{Al}_2\text{O}_3$       d) CO (1)
4. Justify the following :
  - a) Ne has positive value for electron gain enthalpy.
  - b) The electron gain enthalpy of F is lower than that of  $\text{Cl}^-$ .
  - c) The size of  $\text{Al}^{3+}$  is lower than that of F. (3) [March 2018]
5. a) Account for the following:
  - i) Transition elements are d-block elements.
  - ii) Chlorine has high electron gain enthalpy. (2)b) Select isoelectronic species from the following:  
 $\text{O}^-$ ,  $\text{F}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^+$  (2) [July 2017]
6. Electron gain enthalpy is one of the important periodic properties.
  - a) Define electronegativity. (1)
  - b) Explain any two factors affecting electron gain enthalpy. (2)
  - c) Write the oxidation state and covalency of Al in  $[\text{AlF}_6]^{3-}$  (1) [March 2017]
7. a) In the periodic table, elements are classified into four blocks. Explain any two blocks. (2)  
b) Account for the following:
  - i) First ionisation enthalpy of Boron is less than that of carbon.
  - ii) First member of a group differs from the rest of the members of the same group. (2) [September 2016]
8. a) Account for the following:
  - i) Ionisation enthalpy of Nitrogen is greater than that of oxygen.
  - ii) 2<sup>nd</sup> period elements show anomalous behaviour. (3)b) A group of ions are given below. Find one pair which is not Isoelectronic.  
 $\text{Na}^+$ ,  $\text{Al}^{3+}$ ,  $\text{Ca}^{2+}$ ,  $\text{Br}^-$ ,  $\text{F}^-$  (1) [March 2016]
9. Ionization enthalpy and atomic radius are closely related properties.
  - a) Analyze the following graph :





What conclusion can you derive from the graph regarding the first ionization enthalpies of alkali metals and noble gases? Justify your answer. (2)

- b) Aluminium forms  $[\text{AlF}_6]^{3-}$  whereas boron cannot form  $[\text{BF}_6]^{3-}$  but forms  $[\text{BF}_4]^-$  even though both belong to the same group. Explain. (2) [October 2015]

10. Names of elements with atomic numbers greater than 100 are given by IUPAC.

- a) The atomic number of element with IUPAC name 'Ununbium' is .....

- i) 112      ii) 110      iii) 111      iv) 114 (1)

- b) Why is potassium considered as an s-block element? (1)

- c) The first ionisation enthalpy of second period elements generally increase from left to right along the period. Give reason for this general trend. (2) [March 2015]

11. a) Transition elements were placed in groups 3 and group 12 of the periodic table. Give any two characteristics of transition elements. (2)

- b) Does the ionization enthalpy decrease along a group? Give reason. (2) [August 2014]

12. a) The first member of a group of elements in the s and p block differs from the rest of the family in chemical behaviour. Write any one reason for this. (1)

- b) Write the general electronic configuration of d-block elements. (1)

- c) The first ionization enthalpy sodium is lower than that of magnesium but its second ionization enthalpy is higher than that of magnesium. Explain. (2) [March 2014]

13. a) The IUPAC has made some recommendations to name elements with atomic numbers above 100. What would be the name for the element with atomic number 104? (1)

- b) Electro negativity is the ability of an element to attract shared pair of electrons. Name a numerical scale of electro negativity of elements. (1)

- c) Give reason for the following:

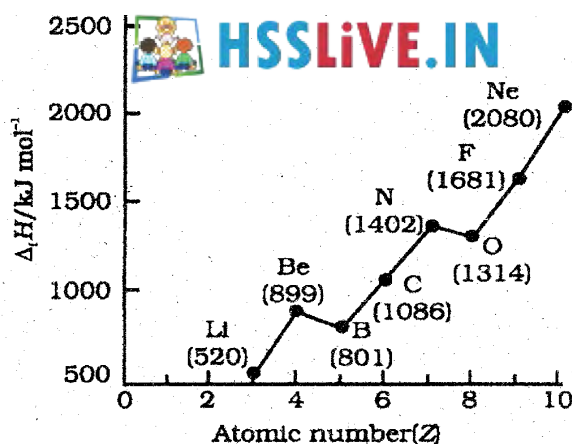
- i) Phosphorus forms  $\text{PCl}_5$  while nitrogen cannot form  $\text{NCl}_5$ . Why? (1)

- ii) The first ionization enthalpy of oxygen is smaller compared to nitrogen. (1) [September 2013]

14. The reactivity of an element is very much related to its ionisation enthalpy.

- a) In general, ionisation enthalpy increases from left to right across a period. Give reason. (1)

- b) Observe the following graph in which the first ionisation enthalpies ( $\Delta_i H$ ) of elements of the second period are plotted against their atomic numbers (Z):



Identify the anomalous values and justify. (3) [March 2013]

15. a) Electron gain enthalpy is the amount of energy released when an isolated gaseous atom accepts an electron to form a mono-valent anion.

The values of electron gain enthalpy with atomic number of halogens are given below:

Element	At. No.	$\Delta_{eg} H$ in kJ/mol
F	9	328
Cl	17	349
Br	35	325
I	53	295

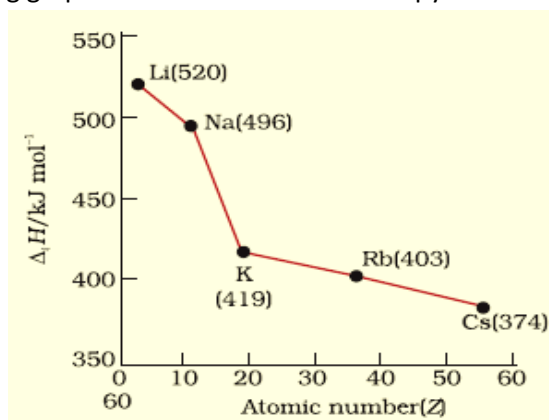
- i) Why electron gain enthalpy decreases from chlorine to iodine? (1)  
 ii) Chlorine has more electron gain enthalpy than Fluorine. Why? (1)

- b) Identify the largest and smallest ion given below:

$O^{2-}$ ,  $F^-$ ,  $Na^+$  and  $Mg^{2+}$  (2) [September 2012]

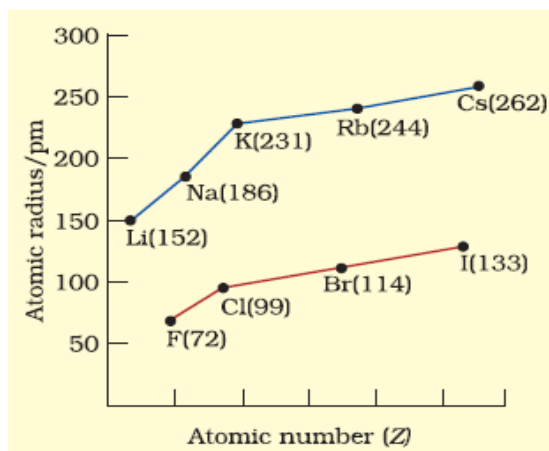
16. Moseley modified Mendeleev's periodic law based on his observations on the X-ray spectra of elements.

- a) State the modern periodic law. (1)  
 b) The IUPAC name of the element with atomic number 109 is ..... (1)  
 c) Analyse the following graph between ionization enthalpy and atomic number.



What do you observe from the graph? Give justification for your observation. (2) [March 2012]

17. a) A graph showing the variation of atomic radius with atomic number for alkali metals is given below.

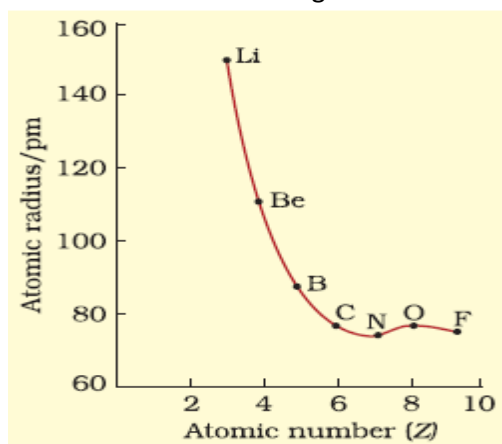


Comment on the variation of atomic radius with increase in atomic number in a group. Give reason. (2)

b) What is meant by isoelectronic species? (1)

c) Select the isoelectronic species from the following.  $N$ ,  $O^{2-}$ ,  $F^-$ ,  $Mg^{2+}$ ,  $Al^{3+}$ ,  $Na^+$  (1) [October 2011]

18. A graph of atomic radius verses atomic number is given below:



a) What do you understand from this graph? (1)

b) Account for the observation that cations are always smaller than the parent atom while anions are always larger than the parent atom. (2)

c) Using the above graph, how will you account for the variation of ionization enthalpy in a period? (1) [March 11]

19. Development of periodic table has made the study of elements and their compounds easier.

a) Discuss about the main features of Mendeleev's periodic table. (2)

b) State the modern periodic law. (1)

c) Give the IUPAC name for the element with atomic number 112. (1) [September 2010]

20. Account for the following:

a) Ionization enthalpy of nitrogen is greater than that of oxygen. (1)

b) Atomic radius decreases from left to right in a period. (1)

c) Electron gain enthalpy of F is less negative than that of Cl. (2) [March 2010]

21. a) Who introduced the periodic law of elements for the first time? State the law. (2)

- b) State the modern periodic law of elements? (2) [March 2009]
22. Elements have electron gain enthalpy and electronegativity.
- a) We two elements belong to the same group. One of us has the highest electronegativity and other, highest electron gain enthalpy. Identify us. (1)
  - b) Define electron gain enthalpy? (1)
  - c) Electron gain enthalpy values of noble gases are zero. Why? (1) [June 2008]
23. A cation is smaller than the corresponding neutral atom while anion is larger. Justify. (3) [February 2008]

